

Trace Mercury Detection at Boron Doped Diamond Electrodes using a Rotating Disk Technique

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Abstract

Quantification of mercury ions at the ppt level is reported using highly boron-doped diamond (BDD) film electrodes by differential pulse voltammetry (DPV). The DPV experiments were performed in nitrate, thiocyanate and chloride media. Investigation in chloride medium is important since practical samples usually contain chloride impurities. The formation of calomel in a chloride medium on the BDD surface is avoided by the co-deposition of purposely-added gold (3 ppm) during DPV detection. Excellent linear calibration plots have been obtained in all media for ppb ranges. Mercury in the 0.005–50 ppb range has been detected using a rotating disk electrode (RDE) technique in real samples (KCl impinger solutions) prepared from flue gas released by a pilot-scale coal-fired combustion facility. A portable instrument has also been used for the detection of mercury efficiently. These studies have demonstrated that BDD mounted in an RDE system together with gold co-deposition is able to detect mercury with sufficient sensitivity for practical analysis of environmental samples.